RHIC Operations Procedures Manual

4.61 PASS SUBSYSTEM TEST: ODH SYSTEM IN SEXTANT 4/ 5

Text Pages 1 through 10
Attachment 1

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials
#1	2/19/97	Att. 1 pg. 6	SVM/SO

Revision No. 1   Approved:

_____ _____

RHIC Project Head   Date

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RHIC-OPM 4.61
Category A

4.61 PASS Subsystem Test: ODH System in Sextant 4/5

1.0   Purpose and Scope

1.1   The purpose of this procedure is to provide instructions for testing the ODH alarm system installed in Sextant 5 of the RHIC ring.

1.2   This procedure will be limited to testing with the Particle Accelerator Safety System (PASS) set to Restricted Access mode.

1.3   The components of the system to be tested include:

1.   Ten ODH sensors designated OS4-1 (Bldg. 1004B), OS6-1 (Bldg. 1006B), OS5-1 through OS5-8 (Sextant 5 tunnel).

2.   Ten Crash/ODH Alarm Boxes, designated 05-CB1, 05-CB2, 05-CB3, 05-CB5, 05-CB6, 05-CB7, 05-CB9, 05-CB10, CB-1004B, CB-1006B

   NOTE   *Boxes 05-CB4 and 05-CB8 do not have ODH alarms.*

3.   Eight air intake vents designated AI5-1 through AI5-6, AI-1004B, AI-1006B.

4.   Eight exhaust fans designated EF5-1 through EF5-6, EF-1004B, EF-1006B.

5.   Two Division A and two Division B PLC's located in Buildings 1004B and 1006B.

4.   The following topics are not within the scope of this procedure:

1.   calibration of the sensors and associated pre-amps.

2.0   Responsibilities

2.1   Members of the RHIC Safety System Section shall, as designated:

   2.1.1   conduct this procedure;

   2.1.2   document tests performed, problems found, and repairs made in the PASS Maintenance Log Book;

   2.1.3   complete the Test Checklist;

   2.1.4   inform the RHIC Safety System Section Head of any as-found failures.

2.2   The RHIC Safety Systems Section Head shall:

   2.2.1   ensure that this procedure is executed at no greater than six month intervals, or at such times as required by the RHIC Accelerator Systems Safety Committee;

   2.2.2   review and sign the completed Test Checklist;

   2.2.3   report any unsafe "as found" failures to the Assistant to the RHIC Project Head for ES&H and the Chairman of the RHIC Accelerator Systems Safety Committee.

2.3   The RHIC Accelerator Systems Safety Committee Chairman (or designee) shall:

   2.3.1   review the test results;

   2.3.2   determine when re-testing is required after changes in hardware or software have been implemented.

3.0   Prerequisites

3.1   Procedures to Execute

   3.1.1   RHIC-OPM 4.60, "ODH Calibration Procedure" shall have been executed for all sensors affected by these tests within the previous 90 days.

3.2   Minimum Personnel

3.2.1   A minimum of three members of the RHIC Safety System Section who will Work in the field. Qualifications and training requirements are:

    1.   RWT-002, "RAD Worker 1"
    2.   "RHIC Access Safety Training"
    3.   These members are designated: "Inspector", "Assistant 1" "Assistant 2"

3.2.2   One Main Control Room Operator or RHIC Safety System Section member who will work in the Main Control Room. This member shall be qualified to:

    1.   operate the PASS Operator Interface in the Main Control Room;

    2.   set the PASS state from Safe state to Restricted Access state for the 5 o'clock sextant, as called for in this procedure.

    3.   Training requirements are: Operation of PASS Operator Interface.

    4.   This member is designated: "Signal Verifier."

3.2.3   One RHIC Safety System Section Engineer who will operate the PASS Development System. This member shall be qualified to:

    1.   selectively disable the Division A using the PASS Development System;

    2.   optionally confirm the independent operation of the A & B Division RIO blocks.

    3.   This member is designated: Engineer

3.3   Equipment

1.   TLD badge.
2.   Helium gas cylinder with flow regulator and plastic tubing to direct the gas flow.
3.   Keys for access to Crash/ODH boxes.
4.   "S" key for access to Collider tunnel.
5.   Large flat-head screwdriver (to open alarm boxes).
6.   Four jumpers (to jumper the ODH printed circuit board).
7.   Wristwatch (to time certain operations).
8.   Hearing protection (the sonalerts are loud).
9.   Tell-Tails to check air intakes.

3.4   Other Prerequisites

1.   The system must be capable of being set to the Restricted Access state.

4.0   Precautions

Optional hearing protection (the sonalerts are loud).

5.0   Procedure

NOTE 1   *Sensors do not need to be tested in consecutive order.*

NOTE 2   *A Test Checklist is associated with each Section and Part. The Checklist is found in Attachment 1.*

NOTE 3   *The "wait time" for multiple alarms may be shortened via the Development System to facilitate testing.*

NOTE 4   *Determination that both and "A" and B" Divisions have independently and correctly responded may be made either by inspection of their related RIO Blocks or via the "A" and "B" Software Development systems.*

NOTE 5   *The fans and air intakes will be checked for operation only, not for air flow rates.*

NOTE 6   *After a sensor has been successfully activated by gas flow, in order to reduce gas wastage, it is permissible to enforce continued activation with a bypass jumper.*

Preliminary Steps

5.1   Inspector: Contact the RHIC Safety Systems Section Head, or designee, to determine which pair of oxygen sensors associated with the 1006B PLC and which pair of sensors associated with the 1004B PLC is to be used when testing the system response to multiple sensor trips.

5.2   Signal Verifier: Inform the MCR Operations Coordinator that the ODH system is to be tested.

5.3   Inspector and Assistants: Each sign out an S-key from the point of issue.

I.   Single Trip Tests

5.4   Signal Verifier: Set the Collider Tunnel to the Restricted Access state.

5.5   Assistant 1: Proceed to appropriate Crash/ODH Box

5.6   Assistant 2: Proceed to appropriate Oxygen Sensor with the gas cylinder and hose assembly.

5.7   <u>Inspector</u>: Proceed to Alcove C in the 5 o'clock sextant. The reason for going to this location is that it is central to the fans that must later be checked and is near the fan control cabinet for the sextant.

5.8   <u>Assistant 2</u>: Apply gas to sensor (both Divisions).

5.9   <u>Assistant 1</u>: Verify that when the sensor trips, both blue strobes flash and both sonalerts activate immediately.

5.10   <u>Signal Verifier</u>: Verify that the Operator Interface indicates an ODH trip and that the PASS state changes to the Safe state (see Note 6).   Begin timing using a watch.

5.11   <u>Inspector</u>: Verify that:

      1.   the ODH System Div. A and Div. B indicate as follows (consult Note 3.2.3):

           A.   Maintenance panels for both Div. "A" and Div. "B" indicate a trip of the sensor under test;

           B.   output LED's for fans and air intakes match those enumerated in the check sheet.

      2.   the exhaust fans activate a few seconds after the trip (may be verified audibly;

      3.   the air intakes open a few seconds after the trip (shall be verified with tell-tails).

5.12   After 10 minutes (±1 minute), verify that the ODH System Div. A and Div. B change as follows (consult Note 3.2.3):

      1.   Output alarm Strobes lit
      2.   RIO Output LED's for fans lit;
      3.   RIO Output LED's for air intakes lit.
      4.   Alarms are being sounded for both Divisions at all Stations
      5.   fans are actually on and air intakes are actually open.

5.13   <u>Assistant</u>: Shut off the gas flow.

5.14   Inspector or Assistant: when the oxygen level rises above 18%, request that MCR reset Sensor Latch.

5.15   Verify that:

1.   The strobes and sonalerts shut off;
2.   Fans actually shut off (typically after 5 minutes).

5.16   **Repeat all of the above steps in this part for OS5-7, OS5-6, OS5-5, OS5-4, OS5-3, OS5-2 and OS5-1. REMEMBER that Sensor testing may be performed in any order and that each sensor is associated with its own local Crash/ODH Box, and the response to a trip may be different. Repeat using a similar method for OS4 -1 and OS6-1. USE THE PROPER Test Checklist!**

II.   Multiple Trip Testing:

5.17   Signal Verifier: Set the area to the Restricted Access state.

5.18   Assistant: Simulate a trip of Sensor 1, Div. A and B, as follows:

5.18.1 Proceed to the Crash/ODH Box to which Sensor 1 is connected, open the Box, and place a jumper across test points TP2 and TP4 of the Div. A and Div. A ODH p.c. boards.

5.19   Inspector: Within 10 minutes of the execution of the previous step, simulate a trip of Sensor 2 as follows: Proceed to the Crash/ODH Box to which Sensor 2 is connected, open the Box, and place a jumper across test points TP2 and TP4 of the Div. A and Div. B ODH p.c. boards.

5.20   Verify that:

1.   the Div. A and B sonalerts and blue strobe lights in the sextant activate. All of the exhaust fans in the sextant activate after a few seconds (EF5-1 through 6) and the Div. A and B Remote I/O Block Output LEDs associated with the fans light (or consult Note 3.2.3);

2.   all of the air intakes in the sextant open after a few seconds (AI5-1 through 6) and the Div. A and B Remote I/O Block Output LEDs associated with the air intakes light (or consult Note 3.2.3);

3.   the PASS state is set to the Safe state (Mode 2) by observing the MCR or maintenance panels.

5.21   Assistant: Remove the jumpers from both Crash/ODH Boxes

5.22   Inspector or Assistant: request that MCR reset Sensor Latch.

5.23   Inspector or Assistant: Verify that

    1.   the alarms shut off;
    2.   the fans shut off (this may take up to 5 minutes (±1 minute)).

5.24   REPEAT steps 5.17 through 5.23 with two other Sensor assemblies in the other half sextant (see Checklist sheets).

III.   Separation of Division A and B (Use proper checklist for each half Sextant)

Sextant

5.25   Engineer: Use the "A" Division development system to activate Fans and Air Intakes.

5.26   Inspector: Verify that: Fans and Intakes are activated.

5.27   Engineer: Deactivate Fans and Air Intakes via the Div. A Development System.

5.28   Inspector: Verify that: fans turn off and Intakes close.

5.29   Signal Verifier: Use the ON push-button @ alcove C to Activate Fans 4, 5, and 6 and Air Intakes 4, 5, and 6.

5.30   Engineer: Deactivate Fans and Air Intakes via the Div. A Development System.

5.31   Inspector: Verify that: Fans and Intakes remain activated.

5.32   Signal Verifier: Use the OFF push-button @ alcove C to deactivate Fans and Air Intakes.

5.33   Repeat steps 5.29 through 5.32 for the other half sextant (see Checklist sheets).

Building 1004B

5.34   <u>Engineer</u>: Use the " A " Division development system to activate Fan and Air Intakes.

5.35   <u>Inspector</u>: Verify that: Fan and Intakes are activated.

5.36   <u>Engineer</u>: Deactivate Fan and Air Intakes via the Div. A Development System.

5.37   <u>Inspector</u>: Verify that: fan turn off and Intakes close.

5.38   <u>Engineer</u>: Use the "B" Division development system to activate Fan and Air Intakes.

5.39   <u>Inspector</u>: Verify that: Fan and Intakes are activated.

5.40   <u>Engineer</u>: Deactivate Fan and Air Intakes via the Div. B Development System.

5.41   <u>Inspector</u>: Verify that: fan turn off and Intakes close.

5.42   REPEAT steps 5.34 through 5.41 for Building 1006B.

IV.   Emergency on Push-button Testing

5.43   Test Emergency on Push-button at 5GE3:

1.   Depress Push-button.

2.   Confirm that Fans 4, 5 and 6.

3.   Turn ON (turn off via off push-button at alcove C.

5.44   Test Emergency on Push-button at 5GE2:

1.   Depress Push-button.

2.   Confirm that Fans 1, 2 and 3.

3.   Turn ON (turn off via off push-button at alcove B).

After Testing is Complete

5.45   When the days testing is complete, return the S-keys to the Main Control Room.

5.46   If all tests are done, sign and date the Test Checklist and submit it to the Safety Systems Section Head for approval.

6.0   Documentation

6.1   Test Checklists

7.0   References

7.1   RHIC-OPM 4.60, "ODH Calibration Procedure"

7.2   **RIO Map**

Alcove A	Alcove B	Alcove C
O2.10/7 Fan 1		O2.10/7 Fan 4
O2.10/6 Fan 2		O2.10/6 Fan 5
	O2.12/5 Fan 3	O2.10/5 Fan 6
O:2.10/4 Vent 1		O:2.10/4 Vent 4
O:2.10/3 Vent 2		O:2.10/3 Vent 5
	O:2.12/2 Vent 3	O:2.10/2 Vent 6

8.0   Attachments

1.   Test Checklist

Fill out Reading Acknowledgment Form

Attachment 1
Test Checklists

I. Single Trip Tests

PLC at 1006B, CCW Loop Part 1: Single Trip Test, OS5-8 Steps 5.4 to 5.15

Action	Response	Method	Initial
Pass state set to Restricted Access. OS5-8 tripped with gas (Div. A and B).	05-CC10 alarm on (both blue strobe lights and both sonalerts).		
Check Panel	Both "A" and "B" Maintenance Panels or MCR Operator Panel shows ODH sensor has tripped		
Check MCR or maintenance Panel	Pass state changes to Safe state.		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 4, 5, 6 lit. or Development Systems in "A" and "B" confirm Command Output		
Check actual fan action	Fans 5, 6 on.		
Check air flow tell-tale	Intakes 4, 5, 6 open.		
After 10 minutes has elapsed...	05-CC6, 7, 9, 10 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System which was used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3 ,4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Shut off gas flow. Wait for sensor to recover to 18%.	All alarms shut off		
Check Panel or Use Development System specify which was used	After MCR Reset of Sensor Latches, Sensors for both "A" and "B" Maintenance Panels show no ODH Hazard		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off (may take 5 minutes.)		

Single Trip Test, OS5-7 PLC at 1006B, CCW Loop Steps 5.4 to 5.15

Action	Response	Method	Initial
Pass state set to Restricted Access. OS5-7 tripped with gas (Div. A and B).	05-CC9 alarm on (both blue strobe lights and both sonalerts).		
Check Panel	Both "A" and "B" Maintenance Panels or MCR Operator Panel shows ODH sensor has tripped		
Check MCR or maintenance Panel	Pass state changes to Safe state.		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check actual fan action	Fans 5, 6 on.		
Check air flow tell-tale	Intakes 4, 5, 6 open.		
After 10 minutes has elapsed...	05-CC6, 7, 9, 10 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3, 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Shut off gas flow. Wait for sensor to recover to 18%.	All alarms shut off		
Check Panel or Use Development System specify which was used	After MCR Reset of Sensor Latches, Sensors for both "A" and "B" Maintenance Panels show no ODH Hazard		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off (may take 5 minutes.)		

Single Trip Test, OS5-6 PLC at 1006B, CCW Loop Steps 5.4 to 5.15

Action	Response	Method	Initial
Pass state set to Restricted Access. OS5-6 tripped with gas (Div. A and B).	05-CC7 alarm on (both blue strobe lights and both sonalerts).		
Check Panel	Both "A" and "B" Maintenance Panels or MCR Operator Panel shows ODH sensor has tripped		
Check MCR or maintenance Panel	Pass state changes to Safe state.		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fan 4 lit or Development Systems in "A" and B" confirm Command		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command		
Check actual fan action	Fan 4 on.		
Check air flow tell-tale	Intakes 4, 5, 6 open.		
After 10 minutes has elapsed..	05-CC6, 7, 9, 10 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3, 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Shut off gas flow. Wait for sensor to recover to 18%.	All alarms shut off		
Check Panel or Use Development System specify which was used	After MCR Reset all Sensors in Both "A" and "B" Maintenance Panels show safe		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off (may take 5 minutes.)		

Single Trip Test, OS5-5 PLC at 1006B, CCW Loop Steps 5.4 to 5.15

Action	Response	Method	Initial
Pass state set to Restricted Access. OS5-5 tripped with gas (Div. A and B).	05-CC6 alarm on (both blue strobe lights and both sonalerts).		
Check Panel	Both "A" and "B" Maintenance Panels or MCR Operator Panel shows ODH sensor has tripped		
Check MCR or maintenance Panel	Pass state changes to Safe state.		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fans 1, 2, 3, 4 lit or Development Systems in "A" and B" confirm Command		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3, 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command		
Check actual fan action	Fan 1, 2, 3, 4 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
After 10 minutes has elapsed..	05-CC6, 7, 9, 10 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3, 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Shut off gas flow. Wait for sensor to recover to 18%.	All alarms shut off		
Check Panel or Use Development System specify which was used	After MCR Reset all Sensors in Both "A" and "B" Maintenance Panels show safe		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off (may take 5 minutes.)		

Single Trip Test, OS5-4 PLC at 1004B, CCW Loop Steps 5.4 to 5.15

Action	Response	Method	Initial
Pass state set to Restricted Access. OS5-4 tripped with gas (Div. A and B).	05-CC5 alarm on (both blue strobe lights and both sonalerts).		
Check Panel	Both "A" and "B" Maintenance Panels or MCR Operator Panel shows tripped ODH sensor		
Check MCR or maintenance Panel	Pass state changes to Safe state.		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fans 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System which was used	Output LED @ RIO Block for Air Intakes 3, 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command		
Check actual fan action	Fans 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 3, 4, 5, 6 open.		
After 10 minutes has elapsed...	05-CC1, 2, 3, 5 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System which was used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3, 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Shut off gas flow. Wait for sensor to recover to 18%.	All alarms shut off.		
Check Panel or Use Development System specify which was used	After MCR Reset all Sensors in Both "A" and "B" Maintenance Panels show safe		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off after 5 minutes.		

Single Trip Test, OS5-3 PLC at 1004B, CCW Loop Steps 5.4 to 5.15

Action	Response	Method	Initial
Pass state set to Restricted Access. OS5-3 tripped with gas (Div. A and B).	05-CC3 alarm on (both blue strobe lights and both sonalerts).		
Check Panel	Both "A" and "B" Maintenance Panels or MCR Operator Panel shows ODH sensor has tripped		
Check MCR or maintenance Panel	Pass state changes to Safe state.		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fan 2 lit or Development Systems in "A" and B" confirm Command		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2 and 3 lit. or Development Systems in "A" and B" confirm Command		
Check actual fan action	Fans 2 on.		
Check air flow tell-tale	Intakes 1, 2 and 3 open.		
After 10 minutes has elapsed...	05-CC1, 2, 3, 5 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3, 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Shut off gas flow. Wait for sensor to recover to 18%.	All alarms shut off		
Check Panel or Use Development System specify which was used	After MCR Reset all Sensors in Both "A" and "B" Maintenance Panels show safe		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off (may take 5 minutes.)		

Single Trip Test, OS5-2 PLC at 1004B, CCW Loop Steps 5.4 to 5.15

Action	Response	Method	Initial
Pass state set to Restricted Access. OS5-2 tripped with gas (Div. A and B).	05-CC2 alarm on (both blue strobe lights and both sonalerts).		
Check Panel	Both "A" and "B" Maintenance Panels or MCR Operator Panel shows ODH sensor has tripped		
Check MCR or maintenance Panel	Pass state changes to Safe state.		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fan 1 and 2 lit or Development Systems in "A" and B" confirm Command		
Check Panel or Use Development System which was used	Output LED @ RIO Block for Air Intakes 1, 2 lit. or Development Systems in "A" and B" confirm Command		
Check actual fan action	Fans 1 and 2 on.		
Check air flow tell-tale	Intakes 1, 2 open.		
After 10 minutes has elapsed...	05-CC1, 2, 3, 5 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3 ,4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Shut off gas flow. Wait for sensor to recover to 18%.	All alarms shut off		
Check Panel or Use Development System specify which was used	After MCR Reset all Sensors in Both "A" and "B" Maintenance Panels show safe		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off (may take 5 minutes.)		

Single Trip Test, OS5-1 PLC at 1004B, CCW Loop Steps 5.4 to 5.15

Action	Response	Method	Initial
Pass state set to Restricted Access. OS5-1 tripped with gas (Div. A and B).	05-CC1 alarm on (both blue strobe lights and both sonalerts).		
Check Panel	Both "A" and "B" Maintenance Panels or MCR Operator Panel shows ODH sensor has tripped		
Check MCR or maintenance Panel	Pass state changes to Safe state.		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fan 1 lit or Development Systems in "A" and B" confirm Command		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2 lit. or Development Systems in "A" and B" confirm Command		
Check actual fan action	Fans 1 on.		
Check air flow tell-tale	Intakes 1, 2 open.		
After 10 minutes has elapsed...	05-CC1, 2, 3, 5 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3 ,4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Shut off gas flow. Wait for sensor to recover to 18%.	All alarms shut off		
Check Panel or Use Development System specify which was used	After MCR Reset all Sensors in Both "A" and "B" Maintenance Panels show safe		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off (may take 5 minutes.)		

Test, OS4-1 PLC at 1004B, Exp. Loop Steps 5.4 to 5.11 & 5.13 to 5.15

Action	Response	Method	Initial
OS4-1 tripped with gas (Div. A and B).	Alarm in Bldg. 1004B on (both blue strobe lights and both sonalerts).		
	1004B Fan on.		
	1004B Intakes opens.		
Shut off gas flow. Wait for sensor to recover to 18%.	Alarm shuts off		
	1004B Fan shuts off (May take 5 minutes).		

Test, OS6-1 PLC at 1006B, Exp. Loop Steps 5.4 to 5.11 & 5.13 to 5.15

Action	Response	Method	Initial
OS6-1 tripped with gas (Div. A and B).	Alarm in Bldg. 1006B on (both blue strobe lights and both sonalerts).		
	1006B Fan on.		
	1006B Intakes opens.		
Shut off gas flow. Wait for sensor to recover to 18%.	Alarm shuts off		
	1006B Fan shuts off (may take 5 minutes).		

II. Multiple Trip Testing

Multiple Trip Test, OS5-1 or 2 or 3 or 4: PLC at 1004B, CW Loop Steps 5.17 to 5.23

Action	Response	Method	Initial
Select two units from among the following 05-CC1, 2, 3, 5 Note in Methods Column which units were selected.	Enter number of units selected		
At first Sensor, open the Box, and place a jumper across test points TP2 and TP4 of the Div. A and Div. B ODH p.c. boards	alarms on (both blue strobe lights and both sonalerts).		
Within ten minutes at second Sensor, open the Box, and place a jumper across test points TP2 and TP4 of the Div. A and Div. B ODH p.c. boards	05-CC1, 2, 3, 5 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System specify which as used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3, 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check MCR or maintenance Panes	Pass state changes to Safe state.		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Remove All jumpers	All alarms shut off		
Check Panel or Use Development System specify which was used	After MCR Reset all Sensors in Both "A" and "B" Maintenance Panels show safe		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off (may take 5 minutes.)		

Multiple Trip Test, OS5-5 or 6 or 7 or 8: PLC at 1006B, CCW Loop Steps 5.17 to 5.23

Action	Response	Method	Initial
Select two units from among the following 05-CC6, 7, 9, 10 Note in Methods Column which units were selected.	Enter number of units selected		
At first Sensor, open the Box, and place a jumper across test points TP2 and TP4 of the Div. A and Div. B ODH p.c. boards	alarms on (both blue strobe lights and both sonalerts).		
Within ten minutes at second Sensor, open the Box, and place a jumper across test points TP2 and TP4 of the Div. A and Div. B ODH p.c. boards	05-CC6, 7, 9, 10 alarms on (both blue strobe lights and both sonalerts).		
Check Panel or Use Development System specify which as used	Output LED @ RIO Block for Fans 1, 2, 3, 4, 5, 6 lit or Development Systems in "A" and B" confirm Command Output		
Check Panel or Use Development System specify which was used	Output LED @ RIO Block for Air Intakes 1, 2, 3, 4, 5, 6 lit. or Development Systems in "A" and B" confirm Command Output		
Check MCR or maintenance Panes	Pass state changes to Safe state.		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 on.		
Check air flow tell-tale	Intakes 1, 2, 3, 4, 5, 6 open.		
Remove All jumpers	All alarms shut off		
Check Panel or Use Development System specify which was used	After MCR Reset all Sensors in Both "A" and "B" Maintenance Panels show safe		
Check actual fan action	Fans 1, 2, 3, 4, 5, 6 shut off (may take 5 minutes.)		

III. Separation of Division A and B PLCs

Sextant 5

CCW Loop Steps 5.25 to 5.32

Action	Response	Method	Initial
Use the "A" Division development system to activate Fans 4, 5, and 6 and Air Intakes 4, 5, and 6	Fans 4, 5, 6 on. Intakes 4, 5, 6 open.		
Deactivate Fans 4, 5, and 6 and Air Intakes 4, 5, and 6 via the Div. A Development System	Fans 4, 5, 6 turn off Intakes 4, 5, 6 close		
Use the ON push-button @ alcove C to Activate Fans 4, 5, and 6 and Air Intakes 4, 5, and 6	Fans 4, 5, 6 on. Intakes 4, 5, 6 open.		
Deactivate Fans 4, 5, and 6 and Air Intakes 4, 5, and 6 via the Div. A Development System	Fans 4, 5, 6 remain on. Intakes 4, 5, 6 remain open.		
Use the OFF push-button @ alcove C to deactivate Fans 4, 5, and 6 and Air Intakes 4, 5, and 6	Fans 4, 5, 6 turn off Intakes 4, 5, 6 close		

CW Loop Steps 5.25 to 5.32

Action	Response	Method	Initial
Use the "A" Division development system to activate Fans 1, 2, and 3 and Air Intakes 1, 2, and 3	Fans 1, 2, 3 on. Intakes 1, 2, 3 open.		
Deactivate Fans 1, 2, and 3 and Air Intakes 1, 2, and 3 via the Div. A Development System	Fans 1, 2, 3 turn off Intakes 1, 2, 3 close		
Use the ON push-button @ alcove A to Activate Fans 1, 2, and 3 and Air Intakes 1, 2, and 3	Fans 1, 2, 3 on. Intakes 1, 2, 3 open.		
Deactivate Fans 1, 2, and 3 and Air Intakes 1, 2, and 3 via the Div. A Development System	Fans 1, 2, 3 remain on. Intakes 1, 2, 3 remain open.		
Use the OFF push-button @ alcove A to deactivate Fans 1, 2, and 3 and Air Intakes 1, 2, and 3	Fans 1, 2, 3 turn off Intakes 1, 2, 3 close		

Buildings 1004B and 1006B

Separation of Division A and B PLC at 1004B, Exp. Loop Steps 5.34 to 5.41

Action	Response	Method	Initial
Activate Fan and Air Intakes in Bldg. 1004B via the "A" Division Development System	Fan in 1004B on. Intakes in 1004B open.		
Deactivate Div. A via the PASS Development System.	Fan in 1004B turns off; Intakes in 1004B close		
Activate Fan and Air Intakes in Bldg. 1004B via the "B" Division Development System or via MCR Command. If MCR command is used, deactivate "A" output	Fan in 1004B on. Intakes in 1004B open.		
Deactivate Div. B via the PASS Development System. Or turn fan off via push-button in alcove A	Fan in 1004B turns off; Intakes in 1004B close		

Separation of Division A and B PLC at 1006B, Exp. Loop Steps 5.34 to 5.41

Action	Response	Method	Initial
Activate Fan and Air Intakes in Bldg. 1006B via the "A" Division Development System	Fan in 1006B on. Intakes in 1006B open.		
Deactivate Div. A via the PASS Development System.	Fan in 1006B turns off; Intakes in 1006B close		
Activate Fan and Air Intakes in Bldg. 1006B via the "B" Division Development System or via MCR Command. If MCR command is used deactivate "A" output	Fan in 1006B on. Intakes in 1006B open.		
Deactivate Div. B via the PASS Development System. Or turn fan off via push-button in alcove A	Fan in 1006B turns off; Intakes in 1006B close		

IV.   **Emergency On Push-buttons**

Emergency On Push-buttons Steps 5.43 to 5.44

Action	Response	Method	Initial
Emergency on Push-button at 5GE3 Depress Push-button	Fans 4, 5, 6 on.		
Check actual fan action	Fans 4, 5, 6 on.		
Turn off via off push-button at alcove C Check actual fan action	Fans 4, 5, 6 shut off (may take 5 minutes.)		
Emergency on Push-button at 5GE2 Depress Push-button	Fans 1, 2 and 3 on		
Check actual fan action	Fans 4, 5, 6 on.		
Turn off via off push-button at alcove B Check actual fan action	Fans 1, 2, 3 shut off (may take 5 minutes.)		

Test Summary:

    <u>Signal Verifier</u>: Check one box.

        No failures found   ″   Failures were found (noted below)   ″

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Notes:

Inspector (sign): _____ Life No. _____ Date:____

Assistant 1 (sign):_____ Life No. _____ Date:_____

Assistant 2 (sign):_____ Life No. _____ Date:_____

Signal Verifier (sign): _____ Life No. _____ Date:_____

Engineer (sign):_____ Life No. _____ Date:_____

Assistant (sign):_____ Life No. _____ Date:_____

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Reviewed by Safety Section Head:_____ Date: _____

Approved by RSC: _____ Date: _____